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WITNESS my hand this
Twenty-sixth day of August 2003

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Patents Act 1990

PROVISIONAL SPECIFICATION

Invention title: Improvements relating to video transmission systems

The invention is described in the following statement:

IMPROVEMENTS RELATING TO VIDEO TRANSMISSION SYSTEMS

FIELD OF THE INVENTION

This invention relates to video transmission systems for use in a wide range of activities, such as marketing, training and health. The systems involve use of a video recorder with a wireless connection to a computer network, through which both streamed and snapshot images can be transmitted to viewers.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved system for presenting video images to remote viewers, or at least to provide an alternative to existing systems.

In one aspect the invention may broadly be said to consist in a method of providing visual information to a client, comprising: (a) operating a video camera to create a stream of video data, (b) transmitting the video stream wirelessly from the camera to a receiver, (c) receiving and monitoring the stream at a server connected to the receiver, (d) transmitting the stream from the server to one or more remote clients over a communications network, and (e) transmitting a snapshot image from the video stream to a client according to a characteristic that is monitored in the stream. Preferably the characteristic is repetition of a substantially static image in the stream.

In another aspect the invention may also be said to consist in a method of providing visual information to a client, comprising: (a) operating a video camera to create a stream of video data, (b) transmitting the video stream wirelessly from the camera to a receiver, (c) receiving the stream at a server connected to the receiver, (d) transmitting the stream from the server to one or more remote clients over a communications network, and (e) transmitting a snapshot image from the video stream to a client in response to a command initiated at either the camera or the server. Preferably the command is created by action of an operator of the video camera, such as by holding the camera substantially stationary to produce a substantially stationary image for a predetermined period, or by activating a

photo function. Preferably the snapshot is created by processing data from a number of frames in the stream.

In still another aspect the invention consists in a system that implements a method according to either of the methods indicated above.

The invention also consists in any alternative combination of features that are indicated or suggested in this specification. All equivalents of these features are considered to be included whether or not specifically set out.

LIST OF FIGURES

Preferred embodiments of the invention will be described in relation to the accompanying drawings, of which:

Figure 1 shows a video transmission system having a single viewer,

Figure 2 shows the system having multiple viewers and a proxy server that may provide a directory service,

Figure 3 is a pictorial view of the system,

Figure 4 is a technical schematic of the system with multiple clients,

Figure 5 shows a static image process for sending snapshots,

Figure 6 shows a request response process for sending snapshots, and

Figure 7 illustrates a typical viewer screen in an example involving horticulture.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings it will be appreciated that the invention may be implemented in a variety of ways for a range of commercial or non-commercial purposes. Details of video recording equipment and computer networks on which the invention may be implemented will be understood by a skilled reader and need not be set out in detail.

A video signal is taken from a video camera and transmitted to a video capture device connected to a computer. A program (the server) running on the computer communicates with the video capture device to continually receive digitised images at the capture

devices highest resolution. Another program (the client) running on one or a number of other machines makes a communication connection over a network such as the Internet or an intranet, to the server (eg: opens a socket over TCP/IP) to allow a bi-directional flow of data to and from the server.

The user interface of the client has one area for showing low resolution video images and another area for displaying higher resolution static images (snapshots). Once a communication connection is made the server sends a continual stream of compressed low resolution video images to the client. The client decompresses the stream and displays the updated image in the video area.

There are a number of methods of signalling to a server to transmit a snapshot to the client to be displayed in the snapshot area.

There are various methods of signalling a server to transmit high resolution static images to a client. The methods described are from two categories. The first category of signalling requires user interaction with the user interface of either the client or the server software. The second category of signalling is based on the degree of similarity of consecutive video images.

The methods of signalling are:

User interaction category

1. An element on the user interface of a client is clicked and a message is sent to the server requesting a snapshot to be sent back (snapshot pull).
2. An element on the user interface of the server is clicked and a snapshot is sent to each connected client (snapshot push).
3. An element on the user interface of the client is clicked and a message is sent to the server requesting a snapshot to be sent back to all clients connected to the server (snapshot push and pull).

Static image category

1. The camera operator presses a photo button on the video camera producing a video signal of the same image on a number of consecutive video frames (snapshot push)
2. The camera is positioned to point to an area that does not change significantly within a given tolerance (snapshot push).

Static image detection to signal transmission of high resolution images to a client

The analog nature of a video signal, the transmission medium and the process of digitisation introduce a degree of systemic noise present in the digitised image passed to the server. Random noise in an image would make it unlikely that any two images would be "exactly" the same.

If the video is a live image of a static scene then small movements of the camera or the scene due to vibration or wind etc. could also result in slight differences from one image to another.

Because of small amounts of variation in the image due to noise or movement then a threshold for the measurement of similarity between the current image and one or a number of previous images is needed. The threshold could either be selected by the user or can default to one or a number of presets.

When the server determines that the current image is static (i.e. above the given threshold of similarity from one or a number of previous images), a high resolution image can be sent to the clients currently connected to the server.

NOTE: Averaging all the images used to determine that the current image is static will result into one new averaged image with an improved signal to noise ratio. If

there were n images then the signal to noise ratio would increase by the square root of n (e.g. 9 images averaged would increase SNR by a factor of 3).

With reference to Figure 4, the camera (10) produces a continuous video signal that is digitised by the video capture device (20). The server (30) captures the digitised image and makes a copy into a cyclic high resolution image buffer (40). Each new digitised image captured is passed to the static image detector algorithm (50). The static image detector algorithm determines if the current image is not significantly different from previous captured images.

When users run the client program (1,2,...n) a communication connection is made from the client (1.1,2.1,...,n.1) to the server (60). Once a connection is made, the server sends a continuous stream of compressed low resolution digital video to each client (1.2, 2.2,...,n.2). When the server (30) is signalled to send a high resolution video image, the server copies an image from the image buffer (40) and sends it to the appropriate client/clients (1.3, 2.3,...n.3).

The methods of signalling the server to send a high resolution image to the client originate from either user interaction or when a static image is detected.

User interaction category

1. An element on the user interface of a client (n) is clicked and a message is sent from the client (n.1) to the server (60) requesting a snapshot to be sent back. An image is copied from the high resolution image buffer (40) and sent to the client (n.3).
2. An element on the user interface of the server (30) is clicked. An image is copied from the high resolution image buffer (40) and sent to each connected client (1.3, 2.3...,n.3).
3. An element on the user interface of a client (n) is clicked and a message is sent from the client (n.1) to the server (60) requesting a snapshot to be sent back to all

clients connected to the server (1,2,...,n). An image is copied from the high resolution image buffer (40) and sent to each connected client (1.3, 2.3....,n.3).

Static image category

1. The camera operator presses a photo button on the video camera (10) producing a video signal of the same image on a number of consecutive video frames. The static image detector algorithm (40) determines that the image is static. The current image is copied from the high resolution image buffer (40) and sent to each connected client (1.3, 2.3....,n.3).
2. The camera (10) is positioned to point to an area that does not change significantly within a given tolerance. The static image detector algorithm (40) determines that the image is static. The current image is copied from the high resolution image buffer (40) and sent to each connected client (1.3, 2.3....,n.3).

Figure 5 gives a server side static image signalling flowchart. A camcorder 10 continuously outputs an analog video signal 20 at a rate of 25 frames per second. The video signal is digitized by a video capture device 30.

The video capture device 30 converts the analog video signal 20 to a series of pixels representing a digitized image 40 with nominal width and height and RGB colour depth (eg: 768 x 576 x 24bit) at a nominal frame rate (eg: 25 fps).

Each digitized image is passed to the server 50 The server stores the current image into a cyclic image buffer 60 RAM at the highest resolution required. The number of images that can be stored in the cyclic image buffer is nominated by the user and is dependant on the frame rate and either the typical lag time for the round trip image data being sent and message returning and/or on the number of consecutive frames nominated to determine a static image, (eg: two seconds worth of images).

The current image is then compared with any previously sent static images 70 a number of images in the cyclic image buffer 80. The server is signalled to send a static image to

the client on the conditions when the current image is significantly different to the previously sent static image and the current image is significantly similar to the other images in the cyclic image buffer. The static image is stored for later comparison and then sent to the client 90.

Figure 6 gives a client side static image signalling flowchart. A camcorder 10 continuously outputs an analog video signal 20 at a rate of 25 frames per second. The video signal is digitized by a video capture device 30.

The video capture device 30 converts the analog video signal 20 to a series of pixels representing a digitized image 40 with nominal width and height and RGB colour depth (eg: 768 x 576 x 24bit) at a nominal frame rate (eg: 25 fps).

Each digitized image is passed to the server 50 The server stores the current image into a cyclic image buffer 60 RAM at the highest resolution required. The number of images that can be stored in the cyclic image buffer is nominated by the user and is dependant on the frame rate and either the typical lag time for the round trip image data being sent and message returning and/or on the number of consecutive frames nominated to determine a static image, (eg: two seconds worth of images).

A viewer viewing the low resolution video clicks on an element on the user interface. This interaction initiates a message to be sent from the client to the server requesting that a high resolution image be sent back. The server checks for messages on each new frame. The next digitized image after a message has been received is then stored for possible later comparison and then sent to the client 90.

The invention enables a wide range of commercial and non-commercial interactions. It can be provided as a hardware and software package that converts a camcorder into a wireless webcasting system by inserting a video transmission device into the hot shoe of a camcorder, which transmits live or recorded video signals to a base station which is

connected to a network such as the Internet or an Intranet, and receives, compresses and serves the images via to one, few or many viewers via a web browser interface.

In this form the invention allows real-time, virtual meetings between the vendor and its customers. Vendors can talk on the phone to customers while using a video camera to take video footage, which is immediately visible to the customer via the vendors' website. The wireless technology allows difficult camera placements and unusual camera angles, so just about any view of the subject, product or event can be easily seen and in intense detail (using the snapshot function which enables the vendor and the viewer to capture high resolution stills at the click of a button).

Use of the invention overcomes the barriers of remoteness by allowing products to be presented live and online, reducing travelling costs, increasing productivity and improving market reach.

How it works:

- A device is attached to a hot shoe to a camcorder (powered from the camcorder or a device battery).
- The device transmits live or recorded video signals back to a base station equipped with video capture device.
- The server software running on the base station communicates with the video capture device to continually receive digitised images at the capture devices highest resolution.
- The client program running on a machine make a communication connection to the server via a network such as the Internet or an intranet, to allow a bi-directional flow of information to and from the server.
- This allows the 'viewer' at the client side to view the invention interface via a 'users' web page.
- The interface consists of low quality streaming video images on one side of the screen and a display frame for higher resolution static images (snapshots) on the other.

- Once a communication connection is made the server software sends a continual stream of compressed low resolution video images to the client software. The client software decompresses the stream and displays the updated image in the video area.
- The viewer/s can securely access these images via a web browser.
- The viewer/s and user can take a 'snapshot' image from the video by:
    - A viewer clicks on the streaming video via the invention interface to receive a snapshot;
    - A viewer clicks on the streaming video via the invention interface to send a 'snapshot' to all session viewers;
    - the user selects the 'take a still' function on the invention server software;
    - the user selects the 'snapshot' function on their personal video camera;
- The viewer/s or user can save 'snapshots'
- The viewer/s or user can print 'snapshots'
- As new 'snapshots' are taken, the replaced images appear as thumbnail images underneath the main high-resolution image.
- These individual image thumbnails are then viewed in full size in the display image frame by the viewer performing a mouse rollover on individual thumbnails.

Possible implementation and use of the invention

User installs server software onto PC, which has a video capture device. The PC is connected to an Internet connection. An RF receiver is then attached to the PC, creating a base station (a PC with server software, connected to the Internet, with receiver attached).

The user then inserts the invention transmitter into the intelligent hot shoe of the personal video camera (camera powered version) or into a standard hot shoe (battery operated version).

When the camera is powered on, the transmitter receives video images from the camera video out, and transmits video images back to the receiver, which is connected to the base station. The server software then receives and compresses the images, then transfers them to the users web server.

When the images are received from the server software, the server then serves the images via the client interface on the user's website. The viewer then views these images (live or recorded) via a standard web browser.

A snapshot image is used to allow the viewer to gain a clear, detailed image, accurate enough to allow for consultation, or purchase decision-making. Taking a snapshot also allows the user and viewer/s to emphasis a particular feature of interest, eg. a single viewer can 'take' a snapshot, which can be seen by all viewers and the user, to clearly indicate which product or feature they are referring to. Snapshots may be numbered to allow easy reference.

The image can be triggered in four ways: The viewer clicks on the streaming video via the web browser, which sends a message to the server to send a high resolution still image to that viewer only. The viewer clicks on the streaming video via the web browser, which sends a message to the server to send a high resolution still image to all viewers participating in the session. The user selects the 'take a snapshot' function on the server software, which sends a high resolution image to the viewer. The user selects the 'snapshot' function on their personal video camera to send a still image to the viewer.

The invention allows the most natural remote communication process. Using traditional fixed or mobile phone lines for audio communication means there are no, or minimal delays, which is important as research shows that more than ¼ second delay causes significant interference with the communication process.

The wireless technology allows the user to walk around freely without being tangled in cables, and the camcorder flip-out screen ensures that the user and viewer seeing the same subject matter. A viewer can request the operator of the camera to survey particular objects. Requests can be transmitted in various ways including fixed or mobile telephone, or over the Internet.

The wide range covered by the invention allows users to transmit images from a large area of their business, for example, large machinery sheds, livestock sheds, crop fields, paddocks, etc. This allows minimal disruption to the business (eg. items don't need to be moved to be viewed) and allows the user to seek specialist advice while keeping infected crops or livestock separated from 'clean' produce.

The snapshot functionality mimics the natural communication action of emphasis or pointing. As both the user and the viewer have the ability to trigger a snapshot which can be viewed by all involved in the session, this serves to allow all parties involved in the session to use a snapshot to 'point' to particular views of a product, which clearly communicates what is subject of discussion.

All users can also view 'session' thumbnails as separate from individually requested thumbnails, and these are numbered. This allows users to refer to previous subjects eg. "if you compare flower in thumbnail 5 to the one in thumbnail 8, it is much healthier". This allows all viewers to easily compare a number of products or subjects.

The invention can be used for:

Marketing and selling goods:

It can be very difficult for producers of perishable products of variable quality (eg. fruit, plants, livestock) to sell sign unseen to a buyer, which represents an enormous problem for businesses that are attempting to reach markets outside their local area. Wholesale nurseries, particularly ones with large and varied product ranges continually face this issue because plant quality varies so much, so quickly. Standard practice is that the wholesaler drives a van of their latest products around to all the buyers to display their product (the 'spec truck'), and then the buyers place their orders on the spot. This is a very time consuming process, the travel costs are high, plants will often not look their best due to travel stress, and it requires a staff member to be out on the road and not in the nursery.

With the invention, buyers can view the produce from their desks – it's easier for them, and much easier for the nurseryman. The interactive nature of the invention means that buyers can instruct the vendor to show them all aspects of the plant (including root system etc.) and they can use the snapshot feature to gain accurate images of plant colour etc.

Also, by cutting out the previously necessary travel for sales meetings, an online meeting with a client can be held at short notice, greatly reducing the length of the sales cycle.

Communications with the export market:
One of the major barriers recognised for businesses trying to access export industries is access to, and communication with export markets, particularly for sellers of livestock and perishable goods such as fruit, vegetables and plants.
For example, a cherry grower in Tasmania exports their goods around Australia, and also overseas. The invention allows the grower to walk around his orchard, packing room, and transport equipment and not only show the potential buyer his produce, but also how that produce will be stored, packed and transported to the client. The snapshot feature allows the client to inspect the fruit for colour, blemishes, disease size. Also, the interactivity of the process allows the client to request to view particular angles of equipment, trees or fruit.

The invention allows vendors to develop personalised 'face-to-face' relationships with buyers, and display all aspects of their goods, and the related production, growing, storage and transport facilities. Such visual inspections and transparency of business processes builds confidence and understanding between vendors and buyers. The invention greatly improves market reach at minimal cost, and in a time-effective manner.

Provision of remote technical and mechanical support remotely:
Technical downtime represents a substantial expense to large machinery companies. For example, the majority of mining industry sites are located in remote areas, and due to the high cost of replacement parts, don't carry full replacement parts at all sites. When a

technical issue is faced, either the onsite staff would send the failed part back to the manufacturer and request a replacement, or call for onsite assistance from a technical specialist. However, this is a costly and time-consuming process, the available technical specialists are limited and mechanical downtime can represent tens of thousands of dollars lost revenue per hour.

The invention will allow onsite staff to use live video to display equipment operation or damage to mechanical support specialists located at other sites, allowing them to quickly identify what action or parts are required to ensure that equipment is back up and running fast to minimise the expense of downtime. The flexibility allowed using a wireless solution allows video and snapshots of all angles of 'hard to reach' machinery. The live, interactive nature of the invention allows the technical specialist to direct the onsite staff to try possible solutions, replace parts and generally perform a range of troubleshooting actions which can provide a solution or allow the mechanical support specialist to identify the fastest way repair the system and return to normal production levels.

This process saves the company travel costs and minimises downtime, and increases the productivity of technical support specialists.

Provision of remote medical consultation:
The invention allows medical practitioners who are separated by distance to make a detailed consultation of a patient, utilising video and high resolution stills to make a diagnosis and agree on a course of action. This is particularly useful due to the demand on specialists who are often based in metro areas. This allows remote specialist consultation to medical facilities in rural, remote areas around the world.

Provision of remote veterinarian services:
The invention will be used by veterinarians to allow remote consultation and diagnoses, but also instruct and undertake autopsies. Eg. the invention will be used by a pig veterinarian specialist to instruct a onsite pig farmer to perform an autopsy (which must be performed within hours after the death) remotely. The pig veterinarian can take and

save snapshots as a record of the autopsy, which can then be used to compare with future autopsy, and identify patterns, new diseases etc. The wireless functionality and use of a camcorder allows a flexible range of camera angles, and allows the user to perform the initial diagnoses and autopsy at the site of death, to avoid possible infection of other animals.

Provision of agricultural consultation services:

Agricultural consultation is available in many fields, however, specialists in many areas are limited, and it is not cost or time effective to engage a specialist consultant to travel to a specific location to inspect livestock, plants etc. especially as the symptom may only be present temporarily (eg. a cow with the initial signs of a disease will have moved to a secondary stage by the time a consultant is available to inspect it.).

For example, the invention can be used for a plant grower in regional Victoria, Australia to consult with a Calla Lilly specialist in New Zealand about an issue with leaf discolouration in a crop of Calla Lillies. The specialist can make a diagnoses and recommend a course of action after instructing the grower to show various views of the plant, allowing him/her to gather the appropriate snapshots to display a detailed view of a variety of aspects of the plant. The consultant is then able to regularly monitor the progress of the crop – from New Zealand.

It can be used by, for example:

- Primary producers
- Technical support companies
- Exporters
- Medical consultation
- Veterinarians
- Building and construction industry
- Real estate
- Car sales
- Education sector

Once the invention is installed, vendors/consultants/technical specialists can talk on the telephone to their clients whilst using a camcorder to take video footage, which is immediately visible to the client via the selected website.

Expected advantages over other systems

- Provides video and high quality stills simultaneously, with the user or viewer/s able to 'take a photo' at any time from the browser, server software or camcorder.
- Wireless technology facilitates difficult camera placements and unusual camera angles.
- Combination of low quality streaming video and high quality snapshots.
- Snapshots can be printed and saved from web browser interface.
- No plug-ins or special software or hardware required at viewers end.
- The user can control playback of recorded video, and utilise camcorder functionality of play, pause, rewind and fast-forward, which can be displayed to the viewer/s.
- Uses a camcorder as the webcasting system, allowing high quality images and flexibility of camera angles and views of subjects; and allows the user to see what the viewer sees through the flip out screen.
- Uses wireless transmitters to allow user to walk around freely.
- Users and viewers can 'take' a high-resolution snapshot in a variety of ways.
- Mobile, wireless webcasting not currently available.
- Uses an analogue RF video transmission signal (not bluetooth) providing more tolerance over longer ranges.
- High resolution images can be printed or saved from web browser, allowing the viewer or user to keep a record of the session.
- Viewers do not require specific hardware, software, plugins etc – a standard browser is required only.
- The transmitter device can be powered from the camcorder, therefore requiring one less device to be charged.
- The transmitter device can be powered an onboard battery.

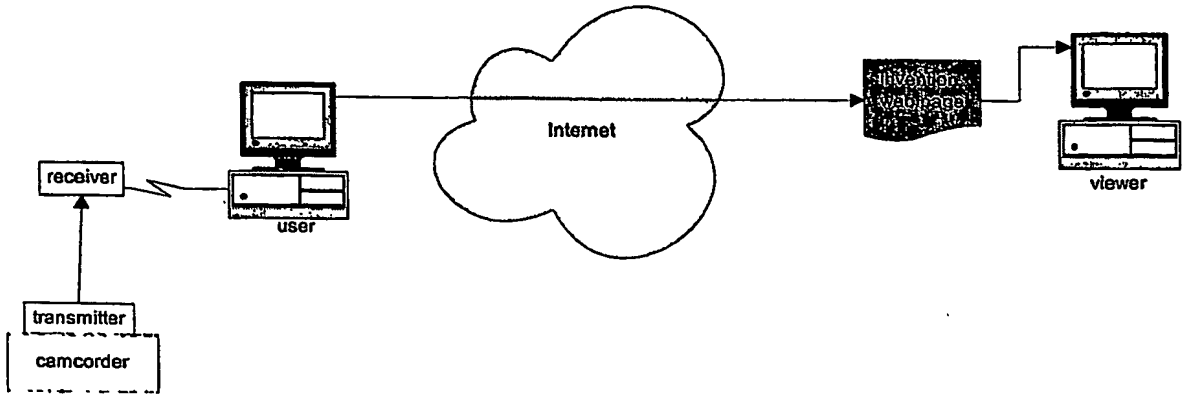

FIGURE 1

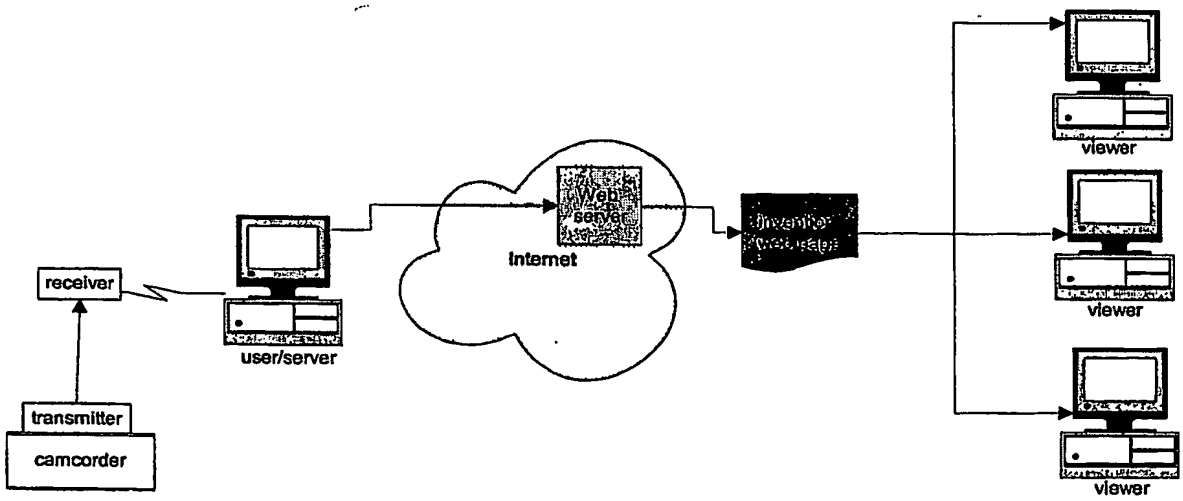

FIGURE 2

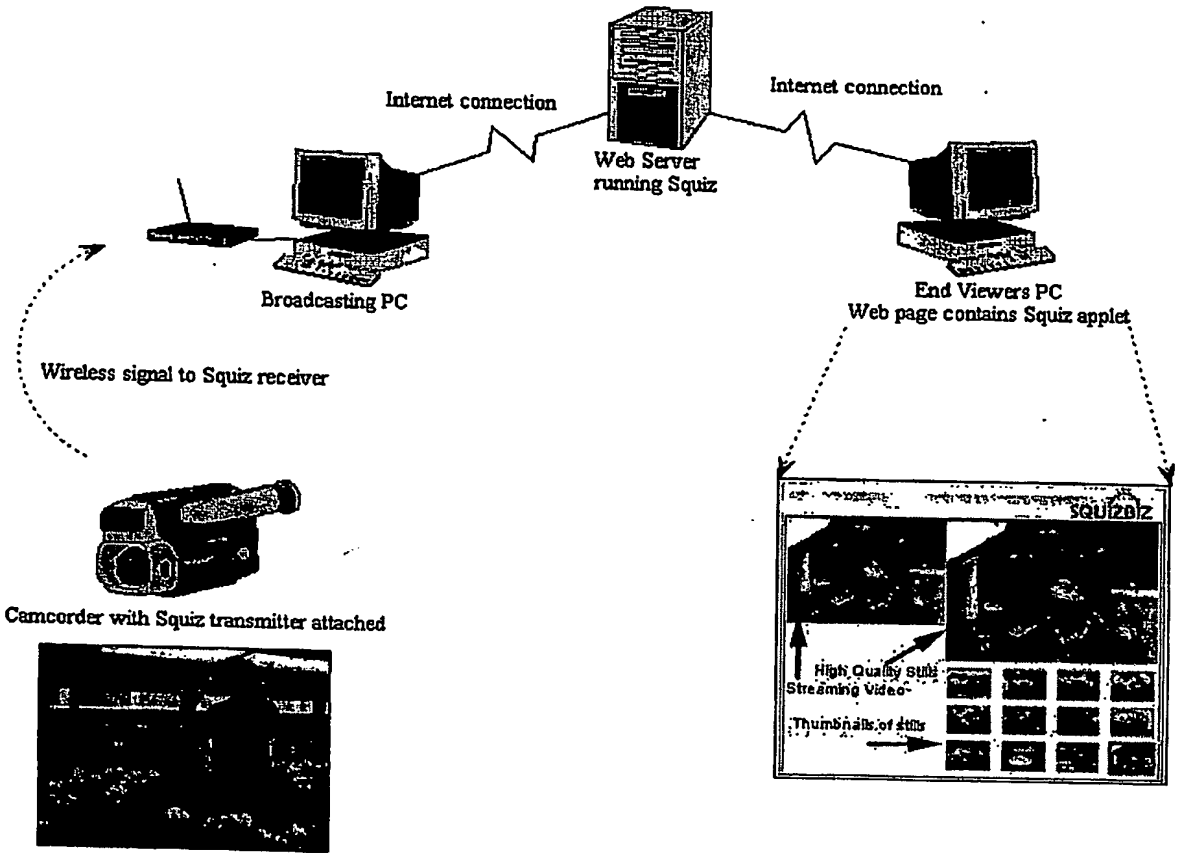
Internet connection
Internet connection
Web Server
running Squiz
Broadcasting PC
End Viewers PC
Web page contains Squiz applet
Wireless signal to Squiz receiver
Camcorder with Squiz transmitter attached
SQUIZ
High Quality Stills
Streaming Video
Thumbnails of stills

FIGURE 3

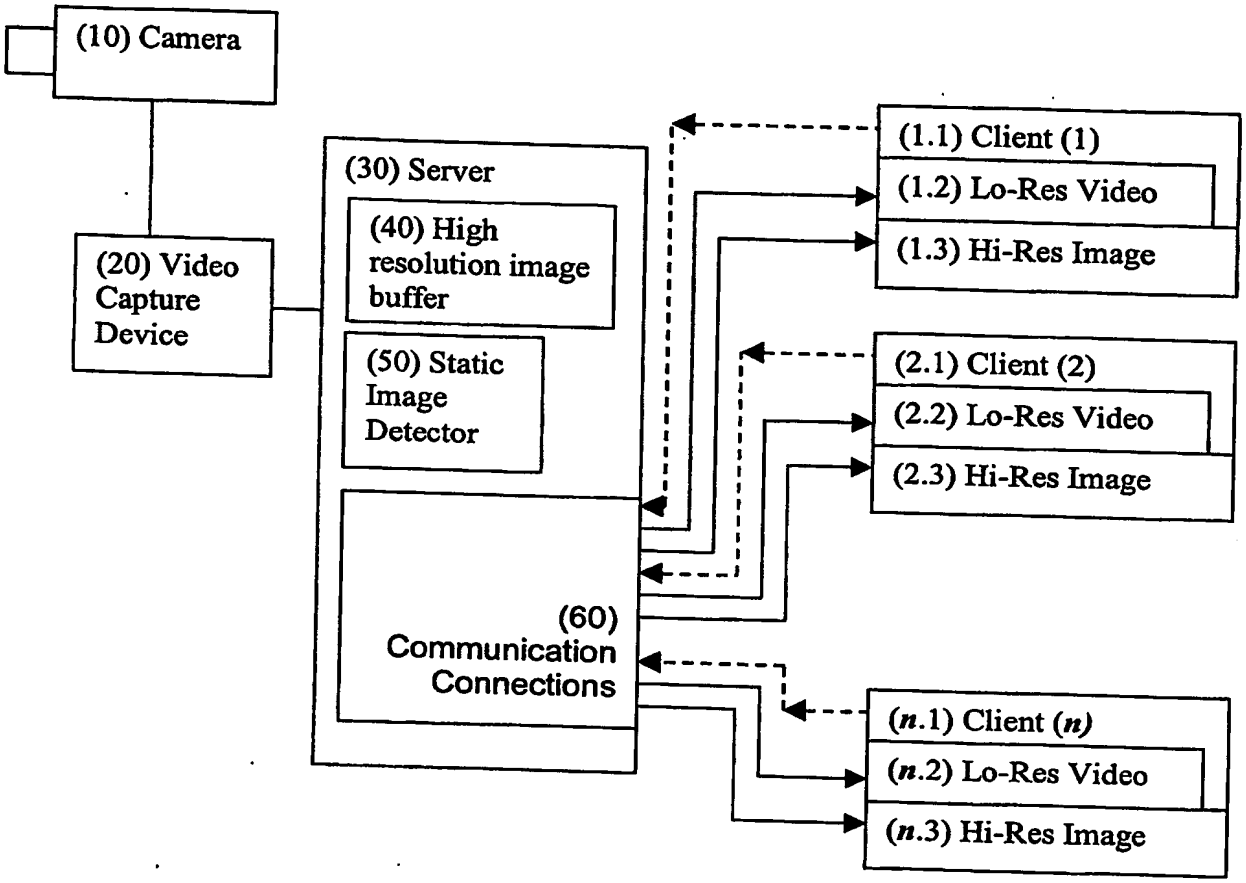
(10) Camera
(20) Video Capture Device
(30) Server
(40) High resolution image buffer
(50) Static Image Detector
(60) Communication Connections
(1.1) Client (1)
(1.2) Lo-Res Video
(1.3) Hi-Res Image
(2.1) Client (2)
(2.2) Lo-Res Video
(2.3) Hi-Res Image
(n.1) Client (n)
(n.2) Lo-Res Video
(n.3) Hi-Res Image

FIGURE 4

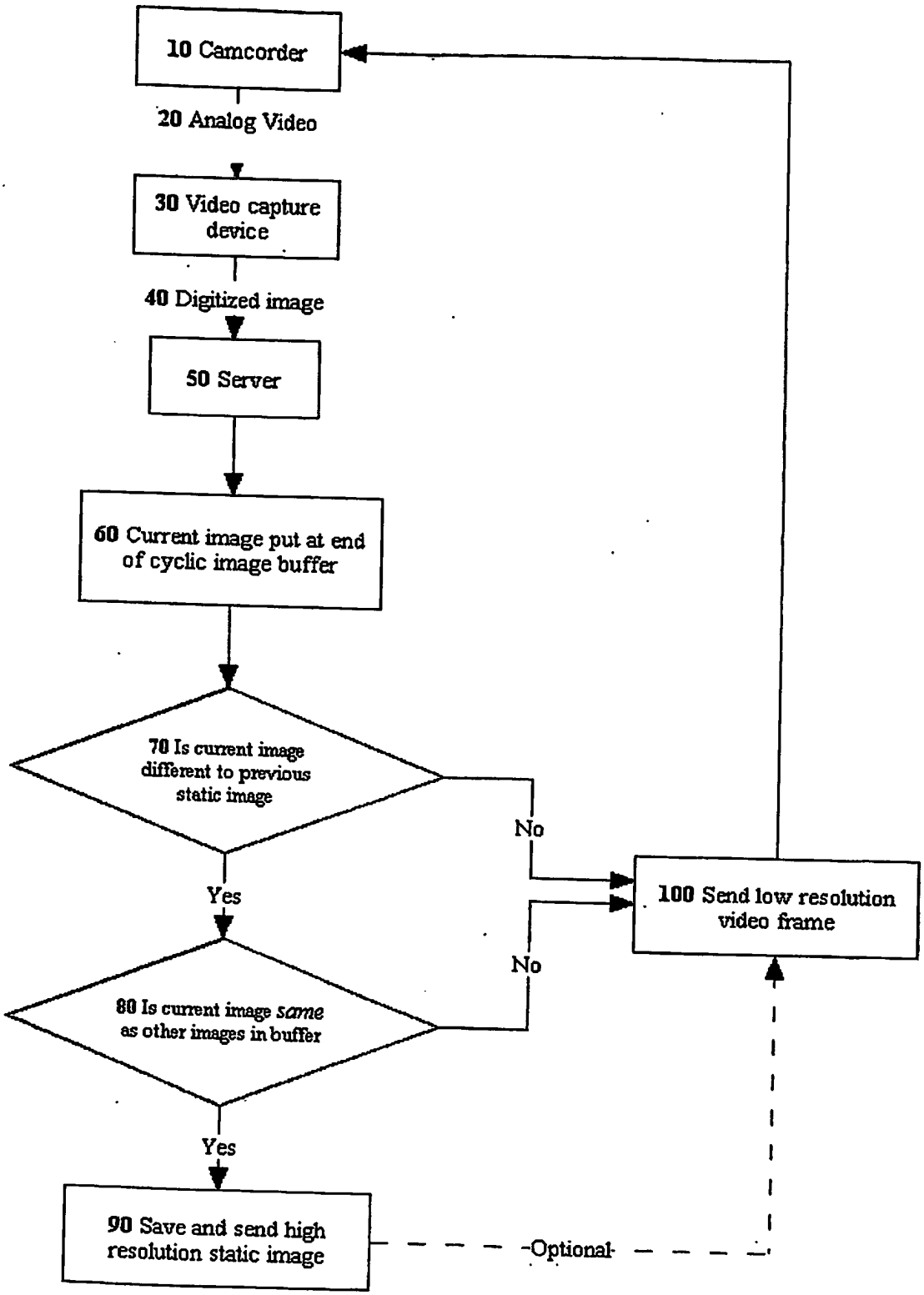
10 Camcorder
20 Analog Video
30 Video capture device
40 Digitized image
50 Server
60 Current image put at end of cyclic image buffer
70 Is current image different to previous static image
No
Yes
80 Is current image same as other images in buffer
No
Yes
100 Send low resolution video frame
90 Save and send high resolution static image
Optional

FIGURE 5

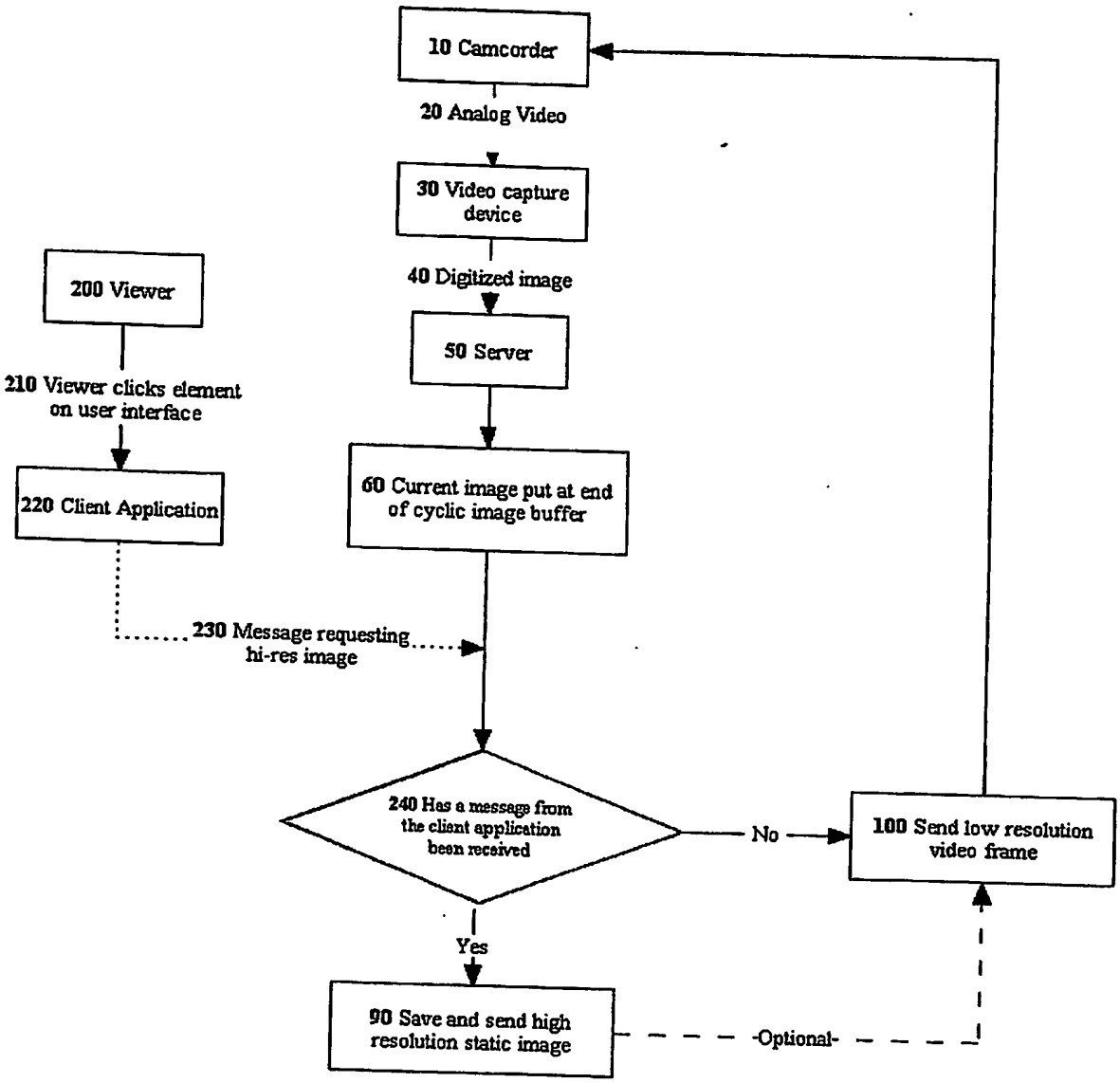
10 Camcorder
20 Analog Video
30 Video capture device
40 Digitized image
50 Server
60 Current image put at end of cyclic image buffer
200 Viewer
210 Viewer clicks element on user interface
220 Client Application
230 Message requesting hi-res image
240 Has a message from the client application been received
No
100 Send low resolution video frame
Yes
90 Save and send high resolution static image
-Optional-

FIGURE 6

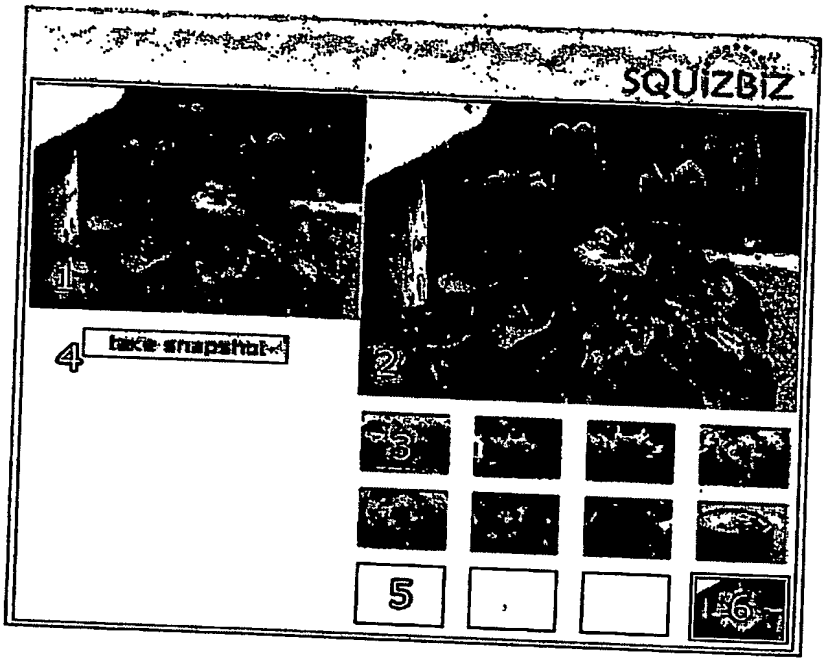

FIGURE 7